UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
75 Hawthorne Street
San Francisco, CA 94105

30 September 2011

Robert W. Wood
Chief, Environmental Management
95 ABW/CEV
5 East Popson Avenue, Bldg. 2650A
Edwards Air Force Base, California 93524-8060

Re: U.S. Environmental Protection Agency (EPA) - EPA Non-Concurrence on the Edwards AFB Draft Final First Five-Year Review Report, NASA Dryden Flight Research Center, Operable Unit 6 (OU 6), Edwards Air Force Base, California, dated August 2011.

Dear Mr. Wood:

The U.S. Environmental Protection Agency (EPA) has reviewed the Air Force's *Draft Final First Five-Year Review Report, NASA Dryden Flight Research Center, Operable Unit 6 (OU 6),* Edwards Air Force Base, California dated August 2011. As explained during the July 2011 teleconference re "*EPA Technical Response to the Air Force Response to Comments (RTCs) on the subject Draft Final Five-Year Review Report*," EPA does not concur with the Air Force's protectiveness determination for Operable Unit 6. EPA has found that a protectiveness determination for the remedy cannot be made at this time until further information is obtained. The State of California, Department of Toxic Substances Control (DTSC) supports EPA's position and informed the Air Force of its decision to non-concur on the protectiveness statement for the subject Draft Final Five Year Review Report (via a letter dated 2 September 2011 to Mr. Ai Duong, Chief, Environmental Restoration Branch, Edwards AFB from Mr. Kevin Depies, RPM, DTSC).

Technical Assessment of the OU 6 Remedy - Protectiveness Statement:

Based upon EPA's technical assessment, the subject Draft Final Five-Year Review Report fails to provide sufficient information to make a protectiveness determination that the remedy at OU 6 is expected to be protective of human health and the environment. Accordingly, and consistent with EPA's 2001 Comprehensive Five-Year Review Guidance, EPA will defer a protectiveness determination for the groundwater remedy until additional information (as described below) has been submitted by the Air Force and reviewed by EPA. It is EPA's expectation that the actions necessary to obtain the additional information should take place within two years from the date of this letter. Upon review of the information, EPA will make a final protectiveness determination.

Data acquisition follow-up actions would include but not limited to additional studies, further analyses and clarifications, and/or additional data collection. This will be one of the major agenda items for the Edwards AFB RPM Meeting re *Five Year Review Administrative Deferment Requirements and Processes* on 5 and 6 October in Oakland, i.e., the development of an *RA Work Plan Addendum* with specific milestones for completing this Five Year Review Report.

Summary of Technical Assessment of Remedy

The major technical deficiencies involve:

1. Contaminant Concentrations: The subject document reflects the lack of knowledge about the extent of constituents (benzene, naphthalene and ethylbenzene) and contaminant levels under and in the vicinity of worker-occupied buildings. It is important that the Air Force use the appropriate toxicity values for a revised VIP risk analysis for current and future workers who may potentially be exposed to VOCs in occupied buildings; and

2) Plume Characterization: Incomplete plume delineation resulting in an inability to conclude that the leading edge of the TCE plume is stable given the increasing contaminant concentrations at monitoring wells in the area.

Technical Assessment of Remedy – Major Issues

1. Vapor Intrusion Pathway (VIP) Risk
The most significant technical issue informing the assessment of the remedy Protectiveness Deferred is the Vapor Intrusion Pathway (VIP) Risk; specifically, changes in both exposure pathways and in VOC concentrations, as well as changes in toxicity criteria.

Three buildings at OU 6 are currently occupied by workers: Buildings 4806**;** 4807 and 4810. There is a concern for the potential vapor intrusion pathway for current or future worker exposure in these buildings. Based on recent groundwater monitoring data, high concentration areas of the benzene plume have migrated beneath Building 4806, while Buildings 4807 and 4810 are in close proximity to migrating plume. Prior to 2010 there were no wells near this building.

Recommended Action: The detection of benzene concentration increases in groundwater and lack of knowledge about the extent and contaminant levels under worker-occupied buildings will require collection of additional information via a Vapor Intrusion Pathway (VIP) Risk Assessment. This additional information is essential in order to make a determination whether the remedy is protective for current or future workers who may potentially be exposed to VOCs in occupied buildings via a preferential vapor intrusion pathway.

A risk assessment for the vapor intrusion pathway must be conducted including both subslab and indoor air sampling. Indoor air sampling must be performed as soon as possible to evaluate risk to workers and additional groundwater monitoring to determine preferential pathway potential. Sampling indoor will help demonstrate if there is a complete pathway and/or potential current exposure.

Also, the Air Force shall use the more conservative State toxicity values within the revised risk assessment for the vapor intrusion pathway. The State of California OEHHA toxicity value is different from EPA's by a factor of 4. Thus, the Agency's industrial indoor air screening value at 10^{-6} is 1.6 ug/m^3, the State's would be 0.4 ug/m^3. In addition, when performing the VIP risk assessment, the Air Force must use 10^{-6} as the point of departure for evaluating risk in terms of the area of risk for both the industrial scenario and for a future residential scenario, and as the trigger for developing action levels within the risk management range.

2. Plume Delineation and Updates of Groundwater Contaminant Concentration Contours.

Another significant technical issue that resulted in non-concurrence involves the delineation and routine updates of the critical groundwater contaminant concentration contours that impact ISCO applications as well as the above-discussed VIP concerns. For example, due to the lack of delineation of the extent of the TCE plume to the east, southeast and south of the N4 area, it cannot be concluded that the leading edge plume is stable given the increasing TCE concentrations at monitoring wells in the area.

Recommended Action: Due to the lack of delineation of the extent of the TCE plume, it cannot be concluded that the leading edge of the plume is behaving as predicted and relied upon in the ROD. The Air Force shall, consistent with the ROD (See Section 2.12.2.2 ": Groundwater Monitoring"), provide sufficient and timely groundwater monitoring data to demonstrate that the current observed plume behavior is consistent with the assumptions of the groundwater monitoring model, then EPA is unable to determine plume stability and/or shrinkage. It should be noted that the ROD requires the Air Force "to verify performance against the modeling predictions, and to ensure that that plume behavior does not change in any unexpected ways that might threaten the regional aquifer." However, should the groundwater monitoring data reveal variance between the assumptions of the model and the expected plume behavior, then the ROD requires the Air Force to submit "a contingency plan to capture anomalous migration of contaminants" (Record of Decision, NASA *Dryden Flight Research Center, Operable Unit 6 (OU 6), Edwards Air Force Base, California, 2006 September, page 2-62).*

Given the increasing contaminant concentrations at monitoring wells in the area, additional wells must be installed to delineate the plume and additional samples must be collected from wells installed in 2010 in order to determine whether the full extent of the TCE plume has been successfully delineated. Based on these results, a contingency plan may be required.

Summary of Technical Assessment of Remedy Performance and Actions Necessary for Final Protectiveness Determination

In sum, EPA has concluded that insufficient data regarding the TCE groundwater plume and the potential vapor intrusion issues present significant uncertainty in the assessment of threats to human health. Accordingly, the Agency has changed the Human Health Environmental Indicator (EI) determination from "Current Human Exposures Controlled" to "Insufficient Data to Determine Human Exposure Control Status**.**"

In addition, EPA is contemplating the need to change the EI for groundwater to a similar non-protectiveness status due to insufficient data to confirm that the TCE contaminated groundwater plume has stabilized, and whether the *in situ* chemical oxidation (ISCO) component of the OU 6 remedy is performing as expected.

As an aid in further preparation for completing this Five Year Review Report, attached please find EPA's general and specific technical comments on the subject Draft Final Five-Year Review report, including additional information and recommendations relative to obtaining EPA concurrence on a final protectiveness determination.

EPA reaffirms its commitment to working in partnership with the Department of the Air Force to expeditiously facilitate the cleanup at Edwards AFB in a manner that is protective of human health and the environment.

Should you have any concerns or require additional information or clarification regarding the Agency's comments, please contact Loren Henning, Chief, Air Force and DOE Section, Superfund Division at 415-972- 3164.

Sincerely,

Michael M. Montgomery
Assistant Director
Federal Facilities and Site Cleanup Branch

Attachments: EPA Comments on Draft Final Five-Year Review Report

cc:

Ai Duong, RPM, EAFB
Dan Medina, AFCEE
Kevin Depies, DTSC RPM
Tim Post, RWQCB RPM
John Steude, RWQCB
Thelma Estrada, EPA ORC

U.S. Environmental Protection Agency
Review of the Responses to Comments
Draft Final First Five-Year Review Report and Redline Version, Operable Unit 6,
Edwards Air Force Base, California, August 2011

NEW GENERAL COMMENTS

1. A number of revisions were made to the text of the revised Draft Final First Five-Year Review (5-Year Review that are not accounted for in the redline/strike-out version of the text. For example, some deletions that have been made do not appear as redline/strike-out text. Additionally, the responses should indicate exactly where the incorporated changes have been made to the text so that original comments can be evaluated, however in many cases the locations of the revision is too general or not provided at all. For future deliverables, please include all deleted text in strike-out form. Additionally, please include the specific location of revisions in the comment responses.

2. Text in Sections 6 and 7 (e.g., the redline text at the bottom of page 7-7) states that the extent of the Site N4 plume has not been delineated in the "northern portion of Site N4," but based on the dashed lines on figures depicting the extent of the plume, the extent of the plume east, southeast, and south of Site N4 has not been delineated. Please revise references to the need to delineate the plume in the "northern portion of Site N4" to state that the plume needs to be delineated to the east, southeast, and south of Site N4.

3. Changes in toxicity values and/or changes in the classification of certain chemicals of concern (COCs) as carcinogens and noncarcinogens, as well as changes to the Johnson and Ettinger (J&E) model, have occurred since 2002 at the time the human health risk assessment (HHRA) for Operable Unit (OU) 6 was prepared by Earth Tech (2003) yet the risk calculations were not updated. Further, the vapor intrusion pathway was only evaluated for four of the six sites where buildings are present, but Sites N4 and N14, where buildings are not currently present, were not evaluated. For transparency and in order to evaluate the cumulative impact of multiple variables on risk and the protectiveness of the remedy, the risk calculations should be updated. Please re-calculate risk using: 1) recent groundwater monitoring data for detected chemicals, 2) revised toxicity values for chemicals previously evaluated, 3) the J&E model to evaluate the vapor intrusion pathway for sites N4 and N14 where buildings are not currently present, and 4) incorporate changes to the J&E model that have been made since 2002. Please also include in the risk calculations chemicals that have been reclassified as carcinogens and non-carcinogens.

4. The 5-Year Review states that OU 6 cleanup levels are based on promulgated standards -- Maximum Contaminant Levels (MCLs) – and because MCLs have not changed, no additional cleanup goals have been developed. However, while there is no MCL for naphthalene, the Department of Toxic Substances Control (DTSC) has reclassified naphthalene as a carcinogen in 2002 (DTSC, 2004) and therefore, a cleanup goal and remedial action objective (RAO) should be developed. In the absence of an MCL for

naphthalene, a risk-based tap-water value should be developed to ensure that the remedy is protective for all groundwater risk drivers. Please develop a remedial goal (RG) for naphthalene or provide additional information to support why a RG does not need to be developed for a new risk driver in groundwater.

NEW SPECIFIC COMMENTS

1. **Section 1.1, Basis, Purpose, and Authority, Page 1-1:** The first paragraph should include the trigger date (i.e., date that the Record of Decision [ROD] was signed, September 28, 2006). The Content Checklist For Five-Year Review Reports in the Comprehensive Five-Year Review Guidance, EPA/540/R-01/007, June 2001 (the Guidance), states that the trigger date should be included in the Introduction. Please include the trigger date in the first paragraph of Section 1.1.

2. **Section 3.3, History of Contamination, Pages 3-5 through 3-20:** The text does not explain how contamination was discovered at each site. Section III in Appendix E of the Guidance indicates that this section should explain how contamination was discovered. Please revise the text for each site to explain briefly how contamination was discovered at each site.

3. **Section 4.2, Remedy Implementation, Pages 4-6 through 4-12:** The text should include a discussion about the performance of each remedy component or state where this information can be found in the 5-Year Review. Please revise the text to discuss the performance of each remedy component or state where this information can be found.

4. **Section 4.3, Operation and Maintenance, Page 4-12:** The text states that the "remedial approach does not include traditional operation and maintenance [O&M] tasks," but this is incorrect. For example, maintaining the Mobile Treatment Unit, maintaining monitoring wells, fixing the damaged well completions identified during the Site Inspection, and replacing missing well tags is considered O&M. Also, based on Section 7.1.2, some wells did not accept the target 57 gallons of sodium permanganate; redeveloping these wells is considered O&M. Please delete or revise the quoted statement to reflect O&M activities relevant to the OU 6 remedy that may include maintaining the Mobile Treatment Unit and monitoring wells, fixing damaged well completions, replacing missing well tags, and redeveloping wells.

5. **Section 7.2.2, Changes in Exposure Pathways, Page 7-9, lines 19-26; Section 7.2.5.1, Changes in VOC Concentrations, Page 7-18; and Section 8.3, Changes in Vapor Intrusion Pathway Risk Assessment:** The text does not explain increased concentrations in the vicinity of worker-occupied buildings. For example, benzene concentrations in the vicinity of Building 4806 appear to have increased based on a comparison of Figures 3-6 and 3-7. The 2002/2003 Risk Assessment did not consider the higher concentrations in the vicinity of this building because additional benzene contamination was discovered when well N3-MW20 was installed; this should be discussed in the text. The text should also discuss uncertainties associated with delineation of the extent of contamination, since there are no wells to determine if

benzene plumes with high concentrations are present beneath Buildings 4806 and 4807. Please revise the text in this section to discuss contaminant concentration changes/trends in the vicinity of worker-occupied buildings. Also, please revise the text to discuss uncertainties associated with delineation of the extent of contamination near these buildings.

6. **Section 7.2.3, Changes in Toxicity and Other Contaminant Characteristics, Page 7-15:** The text acknowledges that naphthalene and ethylbenzene now are considered carcinogens, but the text does not discuss the concentrations of these contaminants in the vicinity of worker-occupied buildings. Please revise the text to discuss the concentrations of naphthalene and ethylbenzene in the vicinity of worker-occupied buildings.

7. **Section 7.2.3 Changes in Toxicity and Other Contaminant Characteristics, Pages 7-13 and 7-14:** The following comments apply to Section 7.2.3:
   a. The point of departure for evaluation cancer risk is 10-6. Results of the risk assessment from vapor intrusion indicate that risks were within or less than the cancer risk range of 10-4 to 10-6 and Hazard Index of 1. For this reason, cleanup levels to protect receptors exposed to chemicals through the vapor intrusion pathway were not established. Please use 10-6 as the point of departure for evaluating risk, not the risk management range, and as the trigger for developing cleanup levels.
   b. This section states that "since concentrations of groundwater VOCs [volatile organic compounds] were present at the site in excess of MCLs, and those groundwater VOCs did not lead to "unacceptable indoor air risks, it is reasonable to conclude that MCLs were also protective of the groundwater-to-indoor air pathway." This conclusion is based on 2002 toxicity criteria used to evaluate the vapor intrusion pathway and may not be valid since some VOCs (e.g., naphthalene and ethylbenzene) have been reclassified as carcinogens and were not previously evaluated as such. Please revise the risk assessment using the updated toxicity values and recent groundwater monitoring data to demonstrate whether or not the chemicals that have now been classified as carcinogens contribute significantly to overall cancer risk (e.g., less than 1 x 10-6); otherwise cleanup goals should be developed for these chemicals.

8. **Section 7.2.4 Changes in Risk Assessment Methods, Pages 7-14 and 7-15:** The potential for migration of VOCs into buildings was not evaluated at Sites N4 and N14; however, VOCs are present in soil, groundwater, or both. According to this section, the vapor intrusion pathway was assessed at sites with VOCs in soil, soil vapor, or groundwater for sites that were, or could be occupied on a routine basis, which included four of the six sites. Current guidance (e.g., DTSC, 2005) requires that future development of a site assume the presence of buildings. Please evaluate the vapor intrusion pathway in the risk assessment for Sites N4 and N14 to determine if vapor intrusion is a future potential exposure pathway of concern.

Additionally, the last sentence at the bottom of Page 7-15 is incomplete. Please add text related to the lack of soil vapor data to the last sentence of this section.

9. **Table 7-3, Changes in Toxicity Criteria Used to Assess the VIP at OU6, Page 7-23:** This table indicates that naphthalene is "no longer considered a non-carcinogen;" however, this is incorrect. Toxicity values for noncarcinogenic effects are available for the oral and the inhalation exposure routes while a toxicity value is also available to evaluate naphthalene for carcinogenic effects by the inhalation exposure route. Please update the table to indicate that naphthalene has been classified as a carcinogen and indicate the availability of an inhalation unit risk factor for this compound.

   Also, three of the entries in the "Change in Risk" column appear to belong in the "Factor" column and it appears that the change in risk for these analytes is missing. Please review and correct the entries in the "Change in Risk" column and the "Factor" column.

10. **Section 8.3, Issues:** This section should include the need for well redevelopment based on the fact that a number of wells were not able to accept the target 57 gallons of sodium permanganate. Please acknowledge this issue in Section 8.3 and include a recommendation and follow-up action in Section 9.

11. **Section 8.4.1, Naphthalene and Ethylbenzene in Groundwater, Page 8-3:** This section indicates that the Air Force would determine if sufficient analytical data are available to characterize current concentrations of naphthalene and ethylbenzene in groundwater but it is unclear why an updated risk assessment was not performed. Section 7.2.3 (Page 7-13, last paragraph) states that "groundwater monitoring data collected within the last 2 to 3 years are available to support this assessment." Please update the risk assessment using the more recent available groundwater data or provide justification to support the decision not to update the risk assessment.

COMMENTS ON RESPONSES TO COMMENTS (RTCs)

Response to General Comment (GC) 1b: The response only partially addresses the original comment. Although the response provides some additional detail for why N3-MW15 and N3-MW21; as well as N4-MW07, N4-MW08, and N4-MW09 were selected for injection during the Phase II Injection Event II, the revised text does not provide any detail about any other injection sites that were or were not included in the Phase II Injection Event II. Additionally the revisions made to the tables in Section 6 make it difficult to differentiate Phase II Injections Events as the Tables only refer to Phase I Injection Event (Table 6-4) and Phase II Injection Event I (Table 6-5 and 6-6) when the text also discusses Phase II Injection Event II. Please revise the text to provide additional details about all the injection sites for Phase II Injection Event II. Also, please revise the and tables to be consistent in presenting the different phases and events for injection.

Response to GC 2: The response partially addresses the comment. According to the 5-Year Review Summary Form, the review period for this 5-Year Review was "11/2/2010 to

8/22/2011;" therefore, it is unclear why the data and information from monitoring after the August 2010 injection event are not included in this 5-Year Review. Additionally documents are referenced in this 5-Year Review that have reporting periods as late as October 2010, therefore this response is inconsistent with other sections of the document. Please include the requested information/data from the post-August 2010 injection event or explain why this data cannot be included.

Also, the Land Use Control (LUC) boundaries should be representative of the most protective conditions (i.e., data through the entire reporting period should be utilized) and it is unclear if the use of June-July 2010 monitoring results are the most up-to-date values for drafting the LUC boundaries. Please use the most protective data available for constructing the LUC boundaries.

Response to GC 4: The response addresses the comment, but was not fully incorporated into the text. Specifically, the work plan mentioned in the comment was not included in Section 9. Please revise Table 9-1 to include the work plan that will include the proposed well locations.

Response to GC 5: The response addresses the comment, but due to the lack of delineation of the extent of the plume to the east, southeast and south of the N4 area, it cannot be concluded that the "leading edge plume instability appears limited to the southern portion of Site N1 and the northern portion of Site N4 as indicated by increasing TCE [trichlorethene] concentrations at monitoring well N4-MW06." Installation of additional wells to delineate the plume (i.e., resolve the lines that are dashed on Figure 3-5) and collection of additional samples from wells installed in 2010 may indicate that there are other areas where the plume is migrating. Please revise the response and text to acknowledge that plume instability cannot be fully assessed because wells installed in 2010 have not been sampled a sufficient number of times to evaluate whether the plume is stable and because the full extent of the TCE plume has not been delineated.

Response to GC 6: The response partially addresses the comment. Based on data from well N3-MW20, Building 4806 is now in close proximity to high concentration areas of the benzene plume. Since there are no wells within, south or east of Building 4806, the concentration of benzene beneath this building is unknown (as acknowledged by the dashed lines on Figure 3-7). Therefore it is unclear if there is an ongoing concern for the vapor intrusion pathway for current or future worker exposure. It appears that additional groundwater monitoring wells and/or subslab and indoor air sampling is necessary to evaluate the risk to workers in this building. Please provide data to support that the remedy is protective for current or future workers who may potentially be exposed to (VOCs in occupied buildings through the vapor intrusion pathway or discuss how and when this data can be obtained.

Response to GC 8: The response partially addresses the comment, i.e. the response indicates that the intent of the In Situ Chemical Oxidation (ISCO) component of the Remedial Action (RA) is to address hot spot remediation only; however, it is not clear if increasing concentrations and an expansion of the plume was an anticipated outcome. Additionally the comment does not address the evaluation of mass destruction given an expanding plume with increasing concentrations. Please discuss whether increasing concentrations and an expansion of the plume was an anticipated outcome and clarify how mass destruction can be evaluated when a plume is expanding and concentrations are increasing.

Response to GC 9: The response partially addresses the comment. It is difficult to assess whether or not cleanup will be achieved via the selected remedy as the concentrations of COCs are increasing and the plume appears to be migrating in some locations. Please revise the 5-Year Review to discuss whether or not cleanup can be achieved within the expected timeframe given the increasing concentrations and expansion of the plume.

Response to GC 10: The response does not specifically address the comment. There is a concern that RAOs and LUCs may not be protective with the increasing concentrations of TCE in N3-MW15, which result in the potential for exposure to VOCs in occupied buildings through the vapor intrusion pathway. Please discuss the protectiveness of the RAOs and LUCs with respect to potential vapor intrusion into buildings located above the groundwater plume.

Also, the response and revised Section 6.5.2.3 are misleading when the text states, "TCE concentrations increased in samples collected from two wells during that timeframe [2003 to 2010]" because this does not acknowledge that TCE concentrations also increased in seven additional wells between 2008 and 2010 (See Table 6-6). These seven wells were either not sampled in 2003 or were installed after 2003. It is important to consider the increased concentrations in these wells (N3-MW03, N3-MW21, N4-MW06, N7-DEW01, N7-MW02, N7-MW15 and N7-MW16) in order to understand the performance of the remedy. Please revise the text to discuss the increases in TCE concentrations in these wells and whether the remedy is performing as intended in the vicinity of these wells.

Response to Specific Comment (SC) 8: The response addresses the comment, but incorrectly references Tables 6-3 and 6-6. Please revise the response to reference the correct tables.

Response to SC 17: The response partially addresses the comment. Although the response states that no new wells are needed to address the benzene plume, new wells are needed in the vicinity of worker-occupied Buildings 4806 and 4807 to delineate the extent of the high concentration benzene plume and to evaluate whether the benzene plume extends beneath these buildings. Please revise the text of the 5-Year Review to include installation of additional monitoring wells to delineate the extent of the benzene plume in the vicinity of Buildings 4806 and 4807.

Response to SC 20: The response only partially addresses the comment as it indicates that a citation will be provided; however, the reference to "supplemental risk assessments" was deleted and was not shown in strike-out in the revised draft final version. Due to this deletion the requested citation was not provided. Please retain the reference to "supplemental risk assessments" and provide a citation.

Response to SC 22: The response does not address the comment. Although the cleanup goals for groundwater are based on MCLs, the absence of an MCL does not preclude the need to develop a cleanup goal for naphthalene, particularly since naphthalene was classified as a carcinogen in 2005 and a cleanup level had not been previously developed. The response indicates that if there is sufficient data to re-evaluate risk for those chemicals with toxicity values that have changed since 2002, the new "information would be used as part of the next 5-Year

Review as the basis for considering if a new RAO is required." If this information is currently available, please re-calculate risk and new RAOs, as applicable, for the 2011 5-Year Review Report.

Response to SC 24: The response does not address the comment as it does not include a discussion of how benzene may impact risk calculations. Please include a discussion of benzene's impact on risk calculations in the response.

Response to SC 27: The comment requested revisions to Section 7.4 that have not been made. Please provide the requested revisions from the original comment, including deleting or changing the word "inadequate" in the last sentence of Section 7.4.

REFERENCES

California Department of Toxic Substances Control (DTSC). 2004. Air Toxics Hot Spots: Adoption of a Unit Risk Value for Naphthalene. http://www.oehha.ca.gov/air/hot_spots/naphth.html#naphth Accessed on September 12, 2011.

DTSC. 2005. Guidance for the Evaluation and Mitigation of Subsurface Vapor Intrusion to Indoor Air. Interim Final. February.

Earth Tech, Inc. 2003. Environmental Restoration Program, Human Health Risk Assessment, NASA Dryden, Operable Unit 6. Prepared for Air Force Flight Test Center/Environmental Restoration Division, Edwards AFB, CA; and AFCEE/ERD, Brooks City Base, TX. San Jose, CA. March.

Lead RPM Joseph Healy
Technical Review Comments on:
***Draft Final First Five-Year Review Report*; and**
***Redline Version, Operable Unit 6*; and**
Air Force Responses to Regulatory Comments

GENERAL COMMENTS

A. The general topics you listed in Section 9 for the next steps to be conducted during the next five years seem to be acceptable, although they are not clearly and concisely described by their titles and by the table entries. They are also inadequately described in their temporal and strategic relationships with each other. Thus, in addition to there being insufficient data and analysis for EPA to concur on protectiveness for some current and potential future risk pathways, there is also insufficient clarity in your presentation of next steps that would address current data gaps, data insufficiencies, and the resolution of currently unacceptable uncertainties in the location of current and potential future risks. Add about 3-5 pages of additional explanatory text to Section 9 in order to correct this fatal flaw. Most of my remaining comments on your responses to my previous comments will provide you with specific improvements to include or summarize within the requested expansion and improvement of Section 9.

B. The report has many instances of inconsistencies that are exacerbated by further inconsistencies within your responses to my comments. I did not have time to review other regulatory comments and your responses to those comments. Thus, I do not know if this is simply a quality control problem in addressing comments that may have conflicts with other reviewers' comments, or if this a problem of misunderstanding and/or not appreciating EPA guidance that has been explained and observed for other operable units at Edwards AFB and at most NPL Sites, nationally. Some of my specific comments will point out some examples.

C. This red-line version of the report is particularly unclear on some key issues. I could not tell how you intend to resolve EPA's need understand the 10^{-6} point of departure for the vapor intrusion pathway in terms of the area of risk at that point of departure for both the industrial scenario and for a future residential scenario. Directly related to this area of potential concern would be the delineation and routine updates of the critical groundwater contaminant concentration contours (not only for ISCO applications, but also potentially for VIP concerns). I also could not tell how you intend to resolve the State's need to understand the effect of using the more conservative State toxicity values within a revised risk assessment for the vapor intrusion pathway. Resolution of these issues will be key to eventually obtaining a protectiveness determination from EPA.

D. The most effective and efficient way to address the above general concerns, would be to produce an RA Work Plan Addendum as soon as possible. In addition to providing necessary updates from where the original RA Work Plan left off, it should provide the details for your commitments from Section 9 of this Five Year Review Report.

E. As you consider the above General Comments while reading through my following Specific Comments, you could use this general comment as an example of the type of summary text that could clarify the scope and relationships of Table 9-2 entries within the larger context of continued OU6 remedy implementation during the next five years (see example table entries immediately following this paragraph). Depending on how you choose to respond to my specific comments, you could end up with a different list or different combination of scopes than what I present below in my "Example Deliverables Schedule for Table 9-2." Scope items listed beneath some of the deliverables could either be listed with the document title in the table or footnoted to the bottom of the table. The footnotes at the bottom of the table could alternatively contain a reference to a sub-section within Section 9 (or elsewhere in the five year review report) that contains further clarification or explanation of the scope (e.g., comprising part or most of the 3-5 pages of additional clarification that I ask for in my General Comment A above).

EXAMPLE DELIVERABLES SCHEDULE FOR TABLE 9-2

2012 DELIVERABLES

RA Work Plan Addendum (2012-2016) [*Draft in Winter 2012*]

including but not limited to:

. Updated plans for ISCO events and new locations
. SAP for ISCO Injection Fluid Tracer Study (expedited to coincide with April 2012 start)
. SAP for Groundwater Monitoring and Data Gaps Study
. Scope and Methods for VIP Risk Assessment
. Annotated Gantt Chart Schedule
. Conditional SAP for Limited VIP Field Investigation

Annual Groundwater Monitoring Report (AGWMR) [*Final in Spring 2012*]

including but not limited to:

. Discussion of updated plume concentration contour map and trend analysis
. Evaluation of plume stability (including rate of shrinkage or migration relative to GW flow rate)
. Recommendations for update of LUC compliance boundaries (link to Annual LUC Rpt)
. Recommendations relevant to next ISCO injection event

Annual LUC Status Report [*Final in early Summer 2012*]

including but not limited to:

. Any changes to the LUC compliance boundaries based on just-released AGWMR (linked)
. Any relevant enforcements or changes to site conditions or land use

Revised VIP Risk Assessment and Risk Mgmt. Eval. Report [*Draft in Summer 2012*]

including but not limited to:

. Assess risk with current media concentrations for all COCs and using State toxicity values
. Calculation of GW Vapor Compliance Levels using 2007 South AFRL ROD approach
. Map showing areas exceeding 10-6 point of departure for industrial and residential scenarios
. Map also shows building occupation status, MCL plume boundary, and GW hot spot areas
. Discussion of general Risk Management options relative to current and long-term protectiveness

2013 DELIVERABLES

IRACR for Phase II Injection III of III [*Final in Spring 2013*]

including but not limited to:

. An Appendix with the 2013 **AGWMR** (see 2012 version for minimum contents)
. A discussion of and conclusions for leading **edge data gaps study**.
. An Appendix with the **ISCO Injection Fluid Tracer Study Report**

Annual LUC Status Report [*Final in early Summer 2013*]

including standard contents (see 2012 version) and link to above 2013 IRACR's AGWMR

Groundwater Modeling Report [*Draft in Summer 2013*]

including but not limited to:
. Discussion of projected plume stability (horizontal and vertical)
. Revised recommendation for scheduling Enhanced Natural Attenuation component of remedy
. Discussion of effects of ISCO injection fluids (linked to **ISCO Injection Fluid Tracer Study Rpt.)**

Addendum to the First Five Year Review Report (AGWMR) [*Draft in Summer 2013*]
including but not limited to:
. Summary of and conclusions for all reports produced due to 2011 EPA Deferral Letter
. Presentation of new versions of Tables 9-1 and 9-2 (e.g., recommendations and next steps)
. A Revised Protectiveness Statement based on newer information
. Discussion of possible need for more immediate actions to ensure protectiveness

2014 DELIVERABLES

Annual Groundwater Monitoring Report (AGWMR) [*Final in Spring 2014*]
(See 2012 version for minimum contents)

Annual LUC Status Report [*Final in early Summer 2014*]
(See 2012 version for minimum contents)

2015 DELIVERABLES

Annual Groundwater Monitoring Report (AGWMR) [*final in Spring 2015*]
(see 2012 version for minimum contents)

Annual LUC Status Report [*Final in early Summer 2015*]
(see 2012 version for minimum contents)

2016 DELIVERABLES

IRACR for Injection IV [*Final in Spring 2016*]
including but not limited to:
. An Appendix with the 2016 **AGWMR** (see 2012 version for minimum contents)
. A discussion of and conclusions for leading edge data gaps study

Annual LUC Status Report [*Final in early Summer 2016*]
including standard contents (see 2012 version) and link to above 2016 IRACR's AGWMR

SPECIFIC COMMENTS

Note: *I have organized my new specific comments into sub-sections based on Deliverables I think you need to produce. Some of these might overlap with deliverables you have already listed in Section 9, although I prefer the more descriptive titles that I use below.*

1. Remedial Action Work Plan Addendum

[1a] Your response to my previous Specific Comment 20: You promised to add "An RAWP addenda" to Table 9-2. However, I did not see this document listed. Addenda is the plural of addendum and perhaps you meant to include several different addenda due to project phasing?

[1b] Your response to my previous Specific Comment 20: You did not answer whether you agree about explaining the schedules, including the SAPs, and O&M plans within the Addendum.

[1c] I strongly recommend that you take the following approach to using an RA Work Plan Addendum. If you prepare an RA Work Plan Addendum on an expedited schedule and obtain regulator buy-in on expedited review times, we will be able to resolve some potentially very critical issues as soon as possible (e.g., possible current VIP exposure in occupied buildings). If you include descriptions in the RA Work Plan Addendum of all the sampling, studies, and evaluations needed for this Five Year Review, in addition to descriptions of the normal extension or expansion of remedy implementation already required by the ROD (e.g., ISCO injections, IRACRs, normal groundwater monitoring and modeling, LUC boundaries and LUC reporting), you will probably have the most effective and efficient vehicle for communicating with and obtaining concurrence from the regulators.

[1d] I think Table 9-2 could include some bullets under the title of this document and then provide further clarification of the overall scope within the requested few extra pages for Section 9 (See my General Comments above). Some of the bullets or additional explanation of the scope could cover some of the documents I list below, and possibly remove the need for listing some of them separately in Table 9-2 (See various individual comments below).

[1e] Your response to my previous Specific Comment 12: If for Section 9 there is not a simple brief explanation of what might cause you to collect soil vapor data (trigger conditions within your risk evaluation), at least list this as one of the parts of your RA Work Plan. Ideally you would determine the need early in the evaluation process so that the data can be expeditiously obtained and discussed in the risk assessment report.

[1f] Your response to my previous Specific Comment 18: You are correct. Thank you for providing estimated dates by Quarter and Year. My newer understanding from the EPA Region 9 Five Year Review expert has clarified what EPA needs since we are now going to defer our protectiveness determination. Because you did not answer or discuss why you would not provide a Gantt Chart schedule and describe the linkages or strategy for document preparation, review, and support for follow-on or concurrent documentation, I need to ask for it again. Of course the simplest way to provide this schedule, in case you can not do it for Section 9, would be to provide it as part of the overall RA Work Plan Addendum's estimated schedule. The work plans for other OUs have provided these kinds of details. EPA Region 9 needs them so that we can report progress and milestones to Congress within our CERCLIS database. We will determine our CERCLIS milestone dates by considering the estimated schedule you provide us.

[1g] Your response to my previous Specific Comment 18: As you can see by the titles of some of the ten documents I have listed and used to organize these specific comments on your Five Year Review Report, there are some primary documents under the FFA. Others might be considered as secondary documents under the FFA. Regardless of how you title them or how you want to interpret the FFA, nearly all of these documents will be critical during the next five years in providing the necessary information for EPA to make a protectiveness determination. Thus, they are likely "key" documents and deserve, at least, a joint discussion of appropriate draft, review, (plus draft final, review for some), and final dates. EPA would like the parties to discuss these dates in early October 2011.

2. Sampling and Analysis Plan for Injection Fluid Tracer Study

[2a] Perhaps you will only need to modify some DQOs to an already existing SAP for groundwater monitoring. I think you might be better off with a specific addendum to another SAP or a stand-alone work plan for this tracer study if you do not intend to follow the RA Work Plan Approach that I strongly recommend above.

[2b] Indicate within a schedule presented in Section 9 when this draft deliverable will be submitted to the regulators.

[2c] Discuss the timing strategy of the SAP and the tracer study within the overall schedule of the next five years. A Gantt chart showing linkages of all key projects for OU 6 is strongly recommended in my general comments and this document is a perfect example illustrating the need for such a master schedule and discussion of its strategy.

3. Sampling and Analysis Plan for Additional Investigation of Vapor Intrusion

[3a] Your response to my previous Specific Comment 12: You state that your evaluation of VIP guidance documents as they related to site conditions may lead to a field investigation. Can you provide an idea of what might lead or trigger you to collect soil vapor data. Is this an early step in the process of assessing the VIP risk? Is it similar in concept to the South AFRL ROD's tiered levels of sampling (e.g., first use groundwater data, then soil vapor data, and then indoor air data according to a decision tree logic)?

[3b] Ideally, this SAP would be part of the RA Work Plan Addendum (e.g., an appendix). However, you might find a quicker way to take some samples by modifying an already existing work plan for another OU that needs to take some indoor or sub-slab samples. Time will likely be of the essence, so please plan to have a SAP ready to go, even if it is a conditional SAP that you later might determine you don't need to activate. The RA Work Plan should explain what would trigger you to activate such sampling.

[3c] If you are not going to use the RA Work Plan Addendum approach I recommend, you may have to list this SAP in Table 9-2 because it could be an essential document in support of resolving part of the VIP Risk Assessment.

4. Revised VIP Risk Assessment and Risk Management Evaluation Report

[4a] Your response to my previous Specific Comment 2: You state that "... the reassessment of the VIP to verify protectiveness is included as a recommendation (Section 9.0)." However, in Section 9 you say you will report on a VIP evaluation. You must clarify what you mean by these terms. EPA expects you to conduct a risk assessment using the new methodologies that you have been using for the other Edwards OUs. This risk assessment will need to include both the residential and the industrial scenario, conservative toxicity values per the State's needs, all

COCs including the newly identified ones, and show on a map where the 10^{-6} point of departure would be for both the industrial and the residential scenario. A separate risk management section can be added to this Risk Assessment Report or can be placed in a separate report (e.g., a letter report or the Addendum to the Five Year Review Report). Presumably the risk management section would offer recommendations for next steps, especially if some of the next steps might involve minor or major changes to the 2006 selected remedy.

[4b] Your response to my previous Specific Comment 3: You state that the VIP will need to be reconsidered in the Next Five Year Review. You need to be more specific. Prior to the completion of the Next Five Year Review, you need to specifically determine whether or not the MCL plume boundary used for the groundwater LUC that currently prohibits residential uses and sensitive uses (e.g., daycares) would conveniently and fortuitously be eligible to serve as a boundary for a vapor intrusion LUC that would prohibit residential and sensitive uses. If so, this could provide a very simple and efficient alternative for consideration in the event that the Risk Assessment determines risk greater than the 10^{-6} point of departure for the VIP. The simplest way to show this would be on a map showing the MCL plume area and VIP risk contour, especially if the VIP risk contour for potential future residences is based on a groundwater concentration developed by similar methodologies to those in the 2007 South AFRL ROD. EPA is looking for a clear commitment that you will consider this as part of your risk evaluation activities to be required by Section 9 of this Five Year Review.

[4c] Your response to my previous Specific Comment 4: Your reasoning appears overly simplistic. The whole point of the requirement to conduct the risk assessment as I describe in the preceding comments, is to verify whether your belief is still correct. If so, then we will likely not see calculated risks above the 10^{-6} point of departure.

[4d] Your response to my previous Specific Comment 4: How the Air Force or NASA voluntarily controls or plans to control land use outside of CERCLA (i.e., not required by a CERCLA ROD) is not relevant to whether the Air Force must conduct a risk assessment and determine protectiveness of the current ROD selected remedy. Your risk assessment must be conducted and must determine the risk for current and future uses that are not restricted. Only in this way can we then ask the next question about whether current responses required by the ROD are providing adequate and desired protection of human health. Thus, residential and sensitive uses must be assessed. In addition, this is especially important since you once had sensitive uses at this industrial site and you currently do not know for sure that the ROD's prohibition of such uses within the MCL plume area is protective enough. If the VIP risk assessment determines risk above the point of departure occurs outside the MCL plume area (e.g., shallow groundwater concentrations lower than MCLs and yet potentially capable of causing indoor air risk above the point of departure), the FFA parties must consider whether additional response actions are necessary. Thus, your risk assessment must be conducted in a manner that, at least, will answer this point of departure question.

[4e] Your response to my previous Specific Comments 9 and 10: If it turns out that you actually do have some occupied industrial buildings that were occupied at the time of the ROD and that were or are located above groundwater concentrations that presented or present a vapor risk of concern, you may need to provide additional clarification for those industrial receptors. I

believe the State and TechLaw are looking at this question in detail within their comments. I note that this is a most critical point to resolve as soon as possible. It may cause you to want to consider speeding up any associated field work that might be necessary to help resolve this question and the magnitude of exposure that has occurred or is continuing to occur.

[4f] Your response to my previous Specific Comment 11: Your response is completely unacceptable, especially if you understand the final sentence of your response within CERCLA.

First, you did not answer my question about the use of groundwater concentrations as a method in the 2007 South AFRL ROD. In fact, that ROD provides for a conservative vapor LUC at a site that could easily make the case for a lower likelihood than OU 6 of no future residential development. I would expect you to make at least a similar conservative risk management approach for OU 6, which is located much closer to development and higher densities of industrial workers and potential residential and sensitive uses than is the remote Air Force Research Lab addressed by the 2007 South AFRL ROD.

Second, EPA HQ is quite clear in their IC Checklist language and other policies that you must specifically determine the levels of residual contamination that are safe for unrestricted use and unlimited exposure. You cannot avoid this by simply assuming that "residential development is not anticipated" especially when contamination could remain at the site for more than 100 years into the future. You would at least need to couple your assumption with a discussion of the degree of certainty you have in your anticipation and with a discussion of the level of residual risk, if your assumption did not hold up in the future.

Third, you have already had a daycare facility at this industrial site in the past. As you have stated elsewhere in the Five Year Review Report, you did not intend the groundwater LUC prohibiting residential and sensitive uses to also prevent exposure to the vapor intrusion pathway. You cannot simply assume that future managers or owners of this property will not consider a similar sensitive use at some point in the future.

Thus, for all of these reasons, you absolutely must assess the residential VIP risk and evaluate current risk management effects on the protectiveness of this OU 6 remedy for such potential future uses.

[4g] Your response to my previous Specific Comment 13: Simply because you state you are concerned about the future residential scenario for VIP by including it in the CSM figure, does not mean that you don't have to justify why you are concerned and explain what you will do about your concern. I think your response is vague, confusing, and maybe even evasive. I think you need to explain what you are doing or going to be doing and why within Section 7.2.4. The current end of the second paragraph is incorrect and inappropriate as a conclusion.

5. Annual Groundwater Monitoring Report

[5a] Your response to my previous Specific Comment 19: I think the lack of basic evaluation details in past reports on monitoring results for this operable unit have contributing to the problems many newcomers have experienced when they join the team, especially as reviewers. The most recent example is the EPA Region 9 Five Year Review Expert. He would strongly support an insistence by EPA that you conduct frequent groundwater monitoring until plume stability or rate of migration are clearly determined. In EPA's experience, most sites that do

routine or long-term groundwater monitoring report their results along with some basic evaluation of the meaning of the results (e.g., updated plume maps and/or trend analysis). It is not clear to EPA where and how you intend to provide this type of information. Thus, I think you should indicate the document that will serve the function of providing this critical analysis. Most other OUs at Edwards use Annual Monitoring Reports and I believe they all are required to provide this information.

[5b] Your response to my previous Specific Comment 19: Your answer is too vague. Why do you not agree? Under what circumstances do you think it is "appropriate" to evaluate groundwater monitoring data? Wouldn't you need to do this to determine whether you need to periodically update the groundwater LUC compliance boundary, which is based on the extent of the MCL plumes? What about during this next five years when you are trying to answer some fundamental questions and data gaps about your plume and its stability?

6. Annual LUC Monitoring Report

[6a] I would think this is already a specified ROD Requirement based on the required IC Checklist language that I believe you included in the 2006 ROD. If so, I do not think it necessarily belongs in this section unless there is some particular issue or new feature that you are now recommending or identifying as a requirement to be associated with this Annual LUC Report. Thus, please consider shortening your list in Table 9-2. You could easily mention this as one of the features in the RA Work Plan Addendum if you want to continue its visibility in this Five Year Review Report.

[6b] How will this report be linked to the report that provides updated MCL plume maps, which I believe is the basis for determining the area in which the groundwater LUCs apply?

7. Interim Remedial Action Completion Report (IRACR)

[7a] I would think this is already a specified RA Work Plan Requirement since you had already been producing these for ISCO injection events according to the original RA Work Plan. If so, I do not think it necessarily belongs in this section unless there is some particular issue or new feature that you are now recommending or identifying as a requirement to be associated with these IRACRs. Thus, please consider shortening your list in Table 9-2. You could easily mention this as one of the features in the RA Work Plan Addendum if you want to continue its visibility in this Five Year Review Report.

[7b] If these IRACRs are intended to also report on particular issues identified in this Five Year Review Report (e.g., groundwater migration issues related to protectiveness, data gap of the leading edge, or the issue about potential plume expansion effects from injection fluids), then you must identify that briefly in the table for the specific IRACR and also provide a bit more clarification in a table footnote or within some of the additional text I have requested for Section 9.

[7c] Normally, IRACRs would be very similar to a functionally equivalent of the interim RA Reports that EPA uses to document completion of discrete phases of remedy construction or implementation. I had thought these were primarily focused on the ISCO injection events and how well the events succeeded in reducing the groundwater concentrations in high concentration areas. If you are also intending to use these for data gap reporting and plume migration tracking (e.g., updating groundwater LUC boundaries), you need to briefly explain that in this section.

[7d] My strong preference would be for you to rely on the Annual Groundwater Monitoring Reports (a standard feature in most groundwater response sites and in most of the other Operable Units at Edwards AFB) for the reporting of issue resolutions for data gap reporting and plume migration tracking (e.g., updating groundwater LUC boundaries). See Annual Groundwater Monitoring Report comments (item 5) above.

8. ISCO Injection Fluid Tracer Study Report

[8a] Presumably, this report would explain the results of the tracer study that I believe you are going to do to resolve an issue identified by TechLaw, Inc. in other comments. I did not review your responses to those comments. Perhaps there is a better title for this study and possibly you have already intended to report the results in an existing report (e.g., an IRACR). Somewhere in Table 9-2, either as a separate report or as a descriptive bullet to an existing report, it needs to be obvious to the reader where you will report the results of this study that is intended to resolve a specific issue.

[8b] Indicate within a schedule presented in Section 9 when this draft deliverable will be submitted to the regulators.

[8c] Discuss the timing strategy of the SAP and the tracer study results within the overall schedule of the next five years. A Gantt chart showing linkages of all key projects for OU 6 is strongly recommended.

9. Groundwater Modeling Report

[9a] Will this report be coordinated with modeling of the Site 25 groundwater plume?

[9b] Does this report need to feed into the resolution of a particular issue specifically identified for this Five Year Review Report or is it simply an activity you periodically conduct as part of your long-term groundwater restoration projects? If it is the latter, perhaps it does not need to be in the Table 9-2 list and can instead be explained as one of the components under the RA Work Plan Addendum umbrella (I made a similar observation about the Annual LUC Monitoring Report - item 6 above).

[9c] Depending on the timing of this report, you might want to delay it so that it can incorporate any relevant conclusions from the ISCO Injection Fluids Tracer Study, the report for which perhaps could be placed in an appendix to this modeling report. The modeling report could then

be titled “Groundwater Modeling and ISCO Injection Fluid Tracer Study Report” and you might save time and money in the process.

10. Addendum to the First Five Year Review Report

[10a] The exact title of this document probably depends on further discussion among the FFA parties concerning EPA guidance appropriate to a Five Year Review for which EPA defers a protectiveness determination. Functionally, there needs to be some type of formal documentation during this next five year review period that summarizes the conclusions of the required next steps identified at the time of the deferral. My understanding is that it would ideally provide the protectiveness determination and/or identify next steps necessary to further clarify or refine any remaining protectiveness issues at that time. For example, if the VIP risk assessment report finds that a currently occupied building has a level of risk that the FFA parties agree needs to be addressed, this Addendum to the Five Year review Report would identify the next steps recommend to resolve that risk (e.g., removal action, building closure or mitigation, potential ROD amendment etc.).

[10b] Ideally, this Addendum would be issued as soon as possible within the first few years of this next five year review. This would allow time to begin implementing any important next steps identified to obtain full protection of human health and the environment as specified in the ROD. It is important to remember that the second Five Year Review Report will be due in September of 2016, regardless of when the deferred protectiveness statement is issued by EPA.